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MAR 25 1921

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS.

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*Technical Memorandum No. 9.*

DEVELOPMENT OF AERONAUTICAL ENGINES BY THE ARMY AND NAVY.

Taken from  
Air Service News Letter, Vol. 5, No. 9,  
March 3, 1921.

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March 3, 1921.



## DEVELOPMENT OF AERONAUTICAL ENGINES BY THE ARMY AND NAVY.

Development of certain types of engines by the Army and Navy Air Services has been recently approved by the Secretary of War and the Secretary of the Navy upon recommendation of the Aeronautical Board.

These engines have been arranged into three groups, namely:

- (a) Engines, the development and use of which are of mutual interest to the Army Air Service and to the Navy Air Service.
- (b) Engines, the development and use of which are primarily of interest to the Army Air Service.
- (c) Engines, the development and use of which are of interest primarily to the Navy Air Service.

In thus dividing these engines into three classes, it should be noted that class (b) and class (c) will, by the process of elimination in a great many cases, be merged with class (a). It is believed that engines now placed in class (b) will never be entirely without interest and value to the Navy Air Service, nor will engines for the present placed in class (c) be entirely without interest and value to the Army Air Service. The list of engines by class is as follows:

Class (a) Of mutual interest to the Army and Navy Air Services.

### 50-60 H.P.

An engine of this power is available but further development of this type of engine has been assigned to the Navy Department.

### 350 H.P. air cooled radial engine:

This engine is placed in this class on account of the maneuverability that can be given to an aircraft equipped with it, reduction in area of vulnerable parts, and a wide range of atmospheric temperature in which it will probably be capable of operating. The development of this engine is now in hand under Army cognizance.

### 550 H.P. water-cooled engine:

For medium weight heavier-than-air craft. An engine of this type is in process of development in commercial hands. Tests are being conducted under Army Cognizance and modi-

fications are being recommended by the Army Air Service.

700 H.P. "W" type Water-cooled engine:

For heavier-than-air craft of large size. This type of engine is in process of development under Army cognizance.

1000 H.P. "W" Type Water-cooled engine:

For aircraft of heavier-than-air type of extremely great size, now in process of design by the Army Air Service.

Engine to operate on heavy oil fuel, probably about 500 H.P. :

The development of this engine is of mutual interest, in view of the existing fuel situation and in view of the desirability of eliminating, to as great an extent as possible, fire hazards existing in the use of present type aviation (airplane) engine fuels. The development of an engine of this type has been undertaken under Navy cognizance.

160 H.P. 6-cylinder water-cooled engine:

This engine is being developed under Army cognizance as an engine for installation in aircraft used in training. The development of this engine and of the engine noted under class (b) of approximately the same H.P. but of radically different type is being carried on with a view to determining which of the two types is the more suitable for a standard engine for this purpose.

300 H.P. cannon engine:

This engine is being developed under Army cognizance, for installation in an aircraft where it is desirable to have a gun of greater than small arms calibre capable of firing directly ahead through the propeller hub.

350 H.P. to 375 H.P. water-cooled engine:

This engine is to be developed and has been a subject of study by the Air Service of the Army for use in installation in pursuit airplanes. The engine contemplated is primarily of the highest performance type, will be highly stressed, of very light weight, and probably of only moderate durability, since the nature of the service to be performed has to justify a design of these characteristics.

300 - 400 H.P. 6-cylinder water-cooled engine.

Engines of this type are being developed under Navy cognizance for installation in rigid airships, or in large non-rigid airships.

Class (b) Engines primarily of interest to the Army Air Service.

140 to 160 H.P. air-cooled engine.

This engine is being developed under Army cognizance as an engine for installation in aircraft used in training.

Class (c) Engines of primary interest to the Navy Air Service.

200 to 230 H.P. radial air-cooled engine.

This engine is being developed under Navy cognizance as a step towards the development of a durable, relatively cheap engine for training purposes, or for small shipboard aircraft. It should be noted that this engine is of a greater power than either of the engines being developed under class (a) for training purposes and of less power than the 350 H.P. air-cooled engine being developed under class (a). Its development is desirable for training purposes since the requirements of the Naval Air Service are such that greater powers are needed in aircraft for training than are required by the Army Air Service. Likewise, it is desirable to have available an engine of domestic manufacture of about this power corresponding with certain well-known engines of foreign manufacture, for use in small shipboard and other type aircraft.

250 to 275 H.P. engine.

This engine is to be developed for use in a twin-engined airplane or seaplane designed as a torpedo carrier, bomber, or spotting machine. It should be noted that the total power of these engines, as contemplated for a twin-engined installation, is approximately equal to that of the 550 H.P. engine noted under class (a), but the development of the smaller engine appears to be desirable from considerations of maneuverability and ease of installation in Naval aircraft designed as torpedo carriers.

650 to 750 H.P. water-cooled engine.

The development of a larger type engine for rigid airships appears to be desirable, in view of the increase in size of this type of aircraft, with a view to reducing complication of power plant to the greatest extent practicable without undue concentration of weights, and at present, it appears that 650 to 750 H.P. represents the maximum power and weight that was practicable to concentrate in a single unit for this purpose. To be developed by the Navy Department.

Steam engines.

The development of the steam engine is to be continued at

once, and worked to a definite conclusion as rapidly as possible.

Geared engines:

The Navy is now engaged in the development of the geared engine for use in its aircraft.

It is probable that the development of both air-cooled and water-cooled engines of the power noted will be desirable. It will be seen the continuance of existing development work and the inception of other projects covering an extremely wide field of engines, both as to power and as to type, has been determined upon. Such wide and detailed development is extremely necessary at this time in order that the availability, or lack of engines of a given type, may not prevent the development of types of aircraft of the greatest utility.

The importance and possible value of the development of an internal combustion engine of turbine type is being followed by the War and Navy Departments and there are some indications that increased progress in aeronautics will warrant its development in the near future.